2.3.2. Scan Angle Limits

2.3.2.1. Purpose

The purpose of this test is to determine the scan angle limits of the radar and their effects upon the utility of the radar search volume.

2.3.2.2. General

As has been discussed in the radar theory section, most airborne radars operate in a raster scan format and often have several operator selectable antenna scan angle limit selections. The largest selection is usually bounded by the physical scan angle limits of the antenna. The bounds are often set by the physical limits of the antenna against the nose cone faring covering the antenna or by line of sight interference between the radar beam and airplane structures. When a lower scan angle limit selection is made in order to concentrate the search volume, the operator is often able to slew around the center of the search volume within these limits. For these reasons, the maximum scan angle limits become critical and should be measured. The maximum limits should then be evaluated while performing a large area target search in a mission relatable situation. The critical parameter for evaluating the results becomes the maximum threat axis width and the amount of search volume needed to be covered by each airplane. During intercepts and attacks, the maximum angle off of the nose to the target expected in mission relatable tactics must be used to evaluate the scan angle limits during STT and small scan angle limit selections. The smaller scan angle limits should be measured and qualitatively evaluated during mission relatable searches where the search volume can be partially defined. The range and number of selections must be suitable for the expected mission scenarios.

2.3.2.3. Instrumentation

Data cards are required for this test with an optional voice recorder.

2.3.2.4. Data Required

Record the heading of the test airplane with the target over the nose and just at the edge of the display for each scan angle setting for both the left and right limit. Record qualitative comments concerning the utility of the maximum scan angle limit and the smaller limit selections.

2.3.2.5. Procedure

Place the target airplane at least 15 nm ahead of the test airplane heading in the same direction and speed as the test airplane. This arrangement is chosen to allow the test turn to be completed without significantly affecting the geometry to the target. At least 2000 feet of altitude separation is advisable for safety reasons. If the display is truncated at the scan angle limit selected, the range must be inside of the truncated area. Place the target just to the right or left of the nose of the test airplane with the sweep centered on the nose. Turn the test airplane slowly toward the target airplane, marking the test airplane heading as the nose crosses the target bearing and as the target passes off of the radar display. Repeat to the other side and for all scan angle limit selections. Qualitatively evaluate the effects of the maximum scan angle limits on the search volume during mission relatable situations where the threat sector is wide and with a limited number of airplanes to cover the sector. Evaluate the utility of the smaller limit selections for concentrating the search volume. Qualitatively evaluate the scan angle limits during mission relatable intercepts and attacks to ensure that contact with the target is not broken.

2.3.2.6. Data Analysis and Presentation

Subtract the bearing to the target while over the test airplane nose from the bearing as contact is lost during the left/right turns at each scan angle limit setting to determine the measured scan angle limits. Where deficiencies are noted during the qualitative evaluation of the scan angle limits, use the measured limits as supporting data. Relate the scan angle limits to their effects upon search volume during wide area search, to their effects and restrictions upon tactics as the angle to the target exceeds the scan angle limit during intercepts and to the range of selections and their utility during mission relatable search situations.

2.3.2.7. Data Cards

A sample data card is provided as card 6.

CARD NUMBER ___ TIME ____ PRIORITY L/M/H

AIR-TO-AIR SCAN ANGLE LIMITS

[PLACE THE TARGET JUST TO THE LEFT OR RIGHT OF THE NOSE AT 15 NM AND ON THE SAME HEADING. MAKE AN EASY TURN TOWARD THE TARGET. RECORD THE TEST AIRCRAFT'S HEADING AS THE TARGET PASSES THROUGH NOSE AND WHEN LOST FROM THE DISPLAY DURING THE TEST AIRPLANE'S TURN. REPEAT TO THE OTHER SIDE AND FOR EACH SCAN ANGLE LIMIT SELECTION.]

RADAR MODE	AZ LIMIT SELECTION	NOSE	L/R	LOST TARGET

[RECORD SCAN ANGLE LIMIT QUALITATIVE COMMENTS UPON THE SEARCH VOLUME AND TRACKING DURING INTERCEPT MANEUVERS.]

SCAN ANGLE LIMIT SELECTION____

TARGET RELATIVE BEARING____

TYPE OF INTERCEPT____

EFFECTS:

Card 6: Air-to-Air Scan Angle Limits Data Card